KNOWLEDGE GRAPH
FOR MULTI BRAND ENGINEERING COLLABORATION

OSLC FEST 2021
2021-11-03
Who AM I?

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Why Are We Here Today?

• Share our experience & expectations on using RDF and OSLC technology
• Use case: Enable Collaboration by keeping track of Engineering Data exchange between partner OEMs and Suppliers.
• This presentation aims at describing:
  – Business needs
  – Challenges
  – Architecture
  – Learnings
  – Looking forward

(Focus only on knowledge graph technology & usage)
About Scania

- Founded in 1891
- Part of VW group
- Main products are heavy trucks and buses
- Worldwide production and sales
- 50,000 employees

- 5000 engineers
- 2000 engineers in electronics and software
- 100,000 sold vehicles per year
- Vehicles in operation:
  - > 1,000,000
  - > 400,000 connected
Our context

Enable TRATON Partner brands for joint development, integration and use of common components within group to benefit intellectual synergy and global scale.
Business Value

- Multibrand Engineering collaboration
- Partnerships that accelerate growth
- Scale and efficiency
Foundation Technologies for Growth

Digital Thread  Digital Twin  Digital Trust
What is knowledge graph & Why ?

- Knowledge graph is a knowledge base that uses a graph-structured data model or topology to integrate data. Knowledge graphs are often used to store interlinked descriptions of entities – objects, events, situations or abstract concepts – while also encoding the semantics underlying the used terminology.

Number of specific uses and applications rely on knowledge graphs. Examples include:

- Data and information-heavy services such as intelligent content and package reuse.
- Responsive and contextually aware content recommendation.
- Knowledge graph powered drug discovery.
- Semantic search.
- Investment market intelligence.
- Information discovery in regulatory documents.
- Advanced drug safety analytics.
- Enterprise Data Governance.
- Research and Knowledge Discovery.
- Many more.
knowledge graph

Deeper Context for More Powerful Insights

Only graphs excel at managing connected data and complex queries, because relationships are at the core of the data model. Knowledge graphs add an additional layer of context to deepen the connections.

1. Data
   Bridge together diverse and disparate data silos regardless of data type, such as structured, unstructured, and semi-structured.

2. Graph
   Map data and draw connections among them for the first layer of dynamic context, which provides immediate understanding.

3. Semantics
   Apply semantics to provide deeper context to connected data. The deeper the context, the more powerful the insights.

Bridge Data Silos
Connect and contextualize the variety of structures and formats of your data so you can operate more efficiently and effectively.

Complete Visibility
Gain complete visibility into data, processes, products, customers, and ecosystems for increased efficiency and enhanced security.

Improved Governance & Compliance
Track data throughout its entire lifecycle – from source to consumption – to build trust and maximize the value of your data governance.

Better Predictions for Better Decisions
Unearth highly predictive relationships for analytics and machine learning models to make more informed predictions and decisions.

Reference neo4j.com
Business Scenario for Scania

TRATON Strategy Statement

We want to become a Global Champion.
TRATON is striving to become a Global Champion of the truck and transport services industry. We build upon our strong base by further expanding our brands’ presence and utilizing our strong network of strategic partners to access all major profit pools. The Group is aiming to realize significant synergies through cooperation between TRATON’s brands and strategic partners.

Business Scenario for Scania

Scania will design & develop common components such as gearboxes, engines, ECU softwares etc which will be used by MAN and Navistar in their Vehicles. Scania Design Engineers needs to collaborate with MAN and Navistar Design engineers during development phase to ensure these components are fit for use in various vehicle configurations and environments.

As design owning brand Scania would like to keep track of its component usage by different brands and map the identity of parts and components used by these brands in their internal systems for better traceability and collaboration.

This business scenario is also applicable when MAN or Navistar is Lead brand for components which are used by other TRATON partners, hence the solution concept is also applicable for all TRATON brands.
Challenge
Further challenge – each brand has

- Many Information Domains
- Many Systems
- Not everything is connected
- Common configuration and change management is critical
## Solution Need

<table>
<thead>
<tr>
<th>Modularity</th>
<th>Federated approach where master data and user remains primarily in own systems</th>
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<tbody>
<tr>
<td>Automated data Exchange</td>
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<td>Multibrand Solution &amp; access Control</td>
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<tr>
<td>Data Sharing Traciability</td>
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<td>Data Correlation Tracribality</td>
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Solution Approach

Build Operational data Layer with help of Knowledge graph Technology

+ Connect with other solution Components
  (out of scope for this presentation)
The very basics
OCR-Solution view
Technical Architecture
OCR - Solution Summary
Generic Solution for Cross Reference needs

Key Benefits

1. Modern Data driven solution & architecture based on Linked data (RDF) Semantic Web Technology
2. Easy to scale for multi brand scenarios and add new brands without any major code changes
3. Can be used for mapping & cross referencing for any kind of collaboration objects (part, drawing, versions etc)
4. Data is managed consistently via standard REST APIs and multi brand approval routine integrated.
5. Each brand don't need to develop & maintain similar cross reference solution
6. Only one standardized interface integration towards central OCR service by each brand for data usage
7. Data is managed, access controlled and owned by each brand inline with involved brands in their collaboration
8. Benefits of the scalability, availability, Security of AWS Cloud Infrastructure
Learnings

Graph data modeling is much flexible compared to traditional relational databases and No SQL database and suitable for managing complex object references and relations.

Solution is Better prepared for cross-domain information analysis and advance use cases using AI/ML.

RDF is powerful but has steep learning curve, difficult to find resources and competence.

Keep end user view usage in mind during ontology design to ensure better query performance.

For consumer application with Interface applications, we identified GraphQL endpoint on top of Triple store is far more efficient mechanism to build services compare to SPARQL or OSLC.

OSLC is good and helpful to work with object referencing and delegated UI when it comes to ALM tools but hard to apply on legacy/Custom Home built systems – Need better tooling and development framework/plugins for scaled usage.
Possible Next steps..

Include More information Objects 😊

Create Federated solution with other partners with similar mechanism- Data modeling harmonization and data integration using RDF and OSLC links

Establish better analysis and visualization tool
Thank You!!!